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Program Guide to Used Oil Recycling

January 1982

Prepared for:
U.S. Department of Energy
Assistant Secretary, Conservation&
Renewable Energy
Office of Industrial Program
Waste Products Utilization Branch
Under Contract No. AC01-80CS40402

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January 1982

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Waste Products Utilization Branch
Washington, D.C. 20585

January 1982

FROM THE WASTE PRODUCTS UTILIZATION BRANCH
OFFICE OF INDUSTRIAL PROGRAMS

We are pleased to send you this "Program Guide to Used Oil Recycling." The purpose of the booklet is to provide information and sample tools necessary in starting a much needed community-wide used oil recycling program.

This year approximately 250 million gallons of valuable used lubricating oil are wasted by America's car owners who change their own oil. Much of this used lubricating oil is disposed of in an environmentally hazardous manner. That's a staggering figure; particularly with today's energy problems.

It does not have to be this way--an increasing number of states and communities have shown considerable concern and have successfully established used oil recycling programs in various parts of the country. To date, some 29 states have announced the establishment of some types of used oil programs which may involve all sectors of the community, from industrial oil users to the "do-it-yourself" mechanic who changes his or her own automobile oil.

However, the overall success of this program is dependent, in large part, upon your help and that of all citizens concerned with the utilization of such a viable resource as used oil.

Your communicty's information package should probably include each of the items listed below. However, our "Guide" merely provides a portion of them. The remaining (i.e., Citizen Brochure, Poster and Bumper Sticker) should be tailored explicitly to your determined needs and can be as simply or comprehensively designed as you consider appropriate. Information from either the USED OIL REPORT included with this Guide can prove useful in brochure preparation.

- Instruction Booklet - a step-by-step outline on how to proceed.
- Citizen Brochure - promoting your program.
- Press Release - to all media and community groups.
- Poster - for a collection point.
- Bumper Sticker - for use also as a sign.
- Letter to civic leader - asks civic leaders and others to help.
- Letter to Manager - asks service stations to be collection points.
- Letter of thanks - to anyone helping your program.
- USED OIL REPORT - DOE background on the national problem.
- Bibliography - for further reading.

The enclosed press release and letters are merely provided here to serve you as a sample. Use them as you wish and feel free to rewrite them in your individual style.

We feel this guide can be a valuable asset for anyone interested in energy conervation through community programs. Study the ideas presented here; add your own; share and exchange them with others who will go into action with you.

HOW TO SET UP

A USED OIL RECYCLING PROGRAM

IN YOUR COMMUNITY

HOW TO SET UP A USED OIL RECYCLING PROGRAM IN YOUR COMMUNITY

INTRODUCTION

The importance of a used oil recycling program is twofold. It not only salvages a valuable energy resource, but also significantly reduces environmental pollution caused by indiscriminate dumping and uncontrolled burning.

Presently, oil that is poured down storm drains, emptied onto the ground, or carted off to garbage dumps eventually seeps into our streams, our lakes, and our water supply. This has been taking place despite the fact that one part of oil can contaminate a million parts of water. But, if used oil is conserved through a recycling program, it can be re-refined and put back to work as lubricant or fuel. Also, it can be utilized as a feedstock in the manufacture of other petrochemcial products.

Finally, the purpose of this booklet is to provide you with information necessary to organize a used oil recycling program, establish collection points, and enlist the cooperation of concerned individuals and civic-minded groups. Maximizing public participation in this worthwhile endeavor and suggested ways to publicize your program will also be addressed in the booklet.

GETTING STARTED

To date, some 29 states have reported the establishment of some type of used oil programs. Some states have even passed laws which make the task of setting up a program easier. It is essential to check with your State Offices of Energy, Environmental Protection and Resource Recovery to ascertain what activities have been taking place at the state level, and what their future plans are. Many states have designated a Used Oil Coordinator to keep track of the various activities in this area.

Step one in getting the project under way is to locate a community group or organization to sponsor your program. Sponsorship by an established organization is also a lot better than trying to do it alone. You will want to work with people who know how to get things done at the local level.

If you already belong to a group that is willing to tackle such a project, you are well ahead of the game. If not, listed below are some of the civic-minded community groups and organizations you may want to approach:

American Association of University Women
American Legion
Audubon Society
Boy Scouts
Girl Scouts
Church Groups
Civic Groups
Educational Organizations
Elks Club
4H Clubs

Fraternal Groups
Friends of the Earth
Future Farmers of America
Jaycees
League of Women Voters
Lions Club
Kiwanis Club
Rotary Club
Sierra Club
Veterans of Foreign Wars
Volunteer Fire Departments
Women's Clubs

To determine which of these organizations are represented in your area, check the local telephone book. If any of them express interest, you might consider running your program as a joint venture. Not only will this broaden your base of operations, but it will place considerably more expertise and influence at your disposal.

Next, you will want to brief all participants in the program on general and specific objectives, on problems that must be faced, and on steps that must be taken to get the project moving.

At this point, it would be a good idea to solicit the advice of individuals or groups with experience in various other public service activities such as local hospital drives, United Fund appeals, and Community Chest campaigns.

ESTABLISHED COLLECTION POINTS

The next logical step in developing a used oil recycling program is to set up your field organization: a network of clearly designated and conveniently situated points where containers of used oil can be delivered.

Ideal collection point locations are individual service stations, municipal garages, private garages, state inspection stations, local oil distribution facilities, fire stations, and retail outlets that provide oil-changing service for their customers. In some cases, high school shop classes also have facilities for collection. School officials can tell you if these facilities are available for your program. Some states require by law that oil retailers must accept used oil. Approximately 800 Sears, Roebuck auto service centers, nationwide, accept used oil.

Convincing the owners, operators, etc., of these sites of the advantages derived from joining your program should be an easy matter. Participation will entail little or no work on their part, and may even generate considerable consumer goodwill. Such display of cooperation will enable them to assume a significant role in fighting environmental pollution and in helping to deal with the energy situation. In addition, the used oil they collect can often be sold at a small profit to re-refining companies. They possibly could be persuaded to turn these profits over to your used oil recycling program or to other worthwhile projects, thereby improving their status in the community even more.

There are several tried-and-true techniques for approaching--and selling--prospective site managers:

1. Visit the prospective site yourself and do an on-the-spot selling job.

2. Send a personal letter which provides background on your community group or organization and solicit the participation or use of his establishment.

3. Arrange to have a personalized form letter mailed to all establishments in your area by your sponsor or a local public official, urging them to cooperate in this important program. For your convenience, we have enclosed a sample of such a letter.

Whichever approach you decide upon, be sure to follow up every successful solicitation with a letter reiterating the importance of the program and expressing your thanks for their cooperation.

Furthermore, acquiring an indepth information regarding re-refiners and/or used oil haulers in your area can prove extremely helpful in your solicitation quest for the collection sites. You may obtain the prevailing rules and standards governing the industry, study them, and discuss them with the prospective site managers in your meetings or whenever you deem appropriate.

WINNING SUPPORT

The level of support you are able to elicit from important and influential people in your community can make all the difference between a program that succeeds and one that fails.

You need their support to get your program started, to promote its expansion, and to ensure its continued success.

Support can come from many sources. In seeking it, here are some of the people and organizations you may wish to approach:

City Council President
Environmental Protection Groups
Fire Chief
Major
Newspaper editors
Radio and TV personalities and station operators
Sanitation Commissioner
Senators and Representatives (Federal and State)
Sewer treatment plant officials
State Energy Office
Water Commissioner
School Board
Other Officials

Support can take many forms. One of the most effective means is to receive endorsement by a local dignitary or celebrity, a civic leader, businessman, or respected community organization.

Endorsements trigger news breaks, feature articles, and editorials. Well-known individuals who endorse your program may be available for appearances on radio or television programs, or speaking engagements at local clubs and educational institutions.

Cooperation by local oil retailers in displaying your posters and making your handbills available on their counters is another form of endorsement. This form of support effectively demonstrates their concern for proper utilization of the products they sell, and in so doing, enhances their public image.

Support of another kind can come from local re-refiners or other individuals who haul used oil. They can help you organize the basic structure of your program: the establishment of convenient collection points and schedules.

One final word on the subject of support. As with the "selling" of collection site prospects, when individuals endorse your program, or make significant contributions to its success, or they go out of their way to help you achieve your objectives, be sure to thank them for their cooperation. A brief, personal letter will not only show your appreciation, but will encourage their continued efforts on your behalf. For your guidance, we have enclosed a typical thank you letter.

PUBLICIZING YOUR PROGRAM

A used oil recycling program may be one of the best things that ever happened to your community, but it will never get off square one unless people know about it. The only way they will ever know about it is for you and the people with whom you are associated to make yourselves heard.

Once the basic framework of your program has been set up--your committee organized, individual responsibilities clearly defined, and a network of collection points established throughout the area--your next step is to make the public aware of what you are doing. The bigger the splash you make the better.

One of the first procedures is to get a press release off to all your local newspapers. You will find a typical release enclosed in this guide. It should, of course, be reworded to suit your local situation.

When distributing press releases, be sure to include radio and television stations on your mailing list. In addition to getting off releases, try to set up interviews with members of the communications media. This will give you an opportunity to sell them in person on the merits of what you are trying to achieve.

You will find that newspapermen and program directors are extremely interested in projects of this type. Anything that involves energy and the environment is newsworthy. Programs that struggle to cope with these vital problems make "good copy."

Newspaper and broadcast people may be able to help you in many other ways, too. After all, they are experts in the business of communication. They know how to dramatize a good story, how to flesh it out, and how to keep public

interest high. So don't simply mail out press releases and wait for publicity to happen. Get on the phone. Talk to your local communications people. Tell them what your aim is. Seek their advice, and ask for their help.

Here are just a few of the possibilities to explore:

- Letters to the editor from prominent people in the community;
- Feature articles by environmental editors;
- Editorials supporting your program;
- Follow-up stories whenever adverse--or favorable--environmental and energy reports become available;
- News releases covering progress reports on your program; major contributions to your program; new endorsements and testimonials; newly established collection sites; and tie-ins with other environmental or energy groups, business, industry, or local government;
- Public service announcements on local radio and television stations. Program directors are required by the FCC to air a substantial number of public service announcements during their daily broadcast schedules. There is no charge for these announcements;
- Participation in radio or television "talk" shows by local celebrities or officials who endorse your program;
- On-the-air interviews with members of your group;
- Radio and television "reports" by officials or businessmen with expertise in energy conservation or environmental protection; and
- It would be helpful to your program is you could "place" a story on the types of containers in which used oil should be stored for delivery to collection sites.

In the process of publicizing your program, seize every opportunity you can to make yourself seen and heard. The more individuals aware of what you are trying to do, the more likely they are to pitch in and help you do it.

COLLECTION POINT POSTER

In addition to getting exposure through the communcations media, you'll want to make sure that all your collection points are "selling themselves" through the use of highly visible identifying posters designed expressly for this purpose.

BUMPER STICKER

Another high-visibility device for calling attention to your efforts is the bumper sticker. Bumper stickers should be distributed to all who are actively

involved in promoting your program, and anybody else who will support the cause. A bumper sticker can be produced by one of your local print shops for a relatively modest cost.

CITIZENS BROCHURE

A key item in your program is the Citizens Brochure. Its brief message warns against pollution, tells how to handle drained dirty oil, and--most importantly--lists the local collection points where used oil will be accepted for recycling.

You need to get this type of brochure into the hands of every do-it-yourself oil changer in the community. One way is to supply a quantity of these brochures to the manager of a cooperating retail store where lubricating oil is sold over-ther-counter. You might ask the manager to put a special point-of-sale poster (RECYCLE USED OIL!) and a stack of brochures right where cans of oil are sold. Alternatively, a supply could be maintained by the cash register, and one placed into each bag carried away by an oil customer.

As a public service, local banks, department stores and utility companies may help you publicize your program, and the collection points, by enclosing the brochure in their monthly mailings.

CONTAINER

Another key item is a suitable container to help the citizen handle the used oil, carry it to the collection site, and neatly empty it. The container should be leak-proof, with a tight-fitting cap--like a plastic gallon milk jug or a detergent container--or something similar which can be bought at a local hardware store. There are a number of different types of containers available. Local inventors and do-it-yourselfers have often developed their own devices and would be happy to talk to you about them.

You will want to impress the do-it-yourselfer with the importance of a proper container. Mishandled, dirty oil can be very messy. Try to make containers available to citizens who participate in your recycling program, and publicize accordingly.

FUND RAISING

Think, too, of the modest financial help you'll want for postage posters, and printing. Remember, service is the same as money. A businessman, company, or group may mail for you, contribute printing, or provide containers free or at cost to citizens willing to bring used oil to collection points.

Plan a modest budget. Ask your sponsor and other supporters for help--in dollars or service--for specific items in your community campaign.

A FINAL NOTE

There are no hard and fast rules for setting up a used oil recycling program, or for winning official endorsement, group support, and public participation. However, the techniques outlined in this booklet provide a good solid basis for tackling some of the problems that will confront you, and thus allow you to take advantage of some of the opportunities that will lead to the success of your endeavor.

In the end, your program will bear the unmistakable stamp of the imaginative, dedicated and hardworking people who have successfully helped your community.

Because this program is yours to conceive and direct in you local community, reference or credit to the Department of Energy should not be necessary in you program literature. However, if you wish to refer to the Department, please use the following: "The Department of Energy endorses the recovery and reuse of used oil."

SAMPLE OF COMMUNICATIONS

(IN DRAFT)

I. PRESS RELEASE

II. LETTER TO CIVIC LEADER

III. LETTER TO SERVICE STATION MANAGER

IV. LETTER OF THANKS

DRAFT (Press Release)

FROM: (Name)
(Org.)
(Address)

Date:
Contact: (Name)
Phone: (Number)

FOR RELEASE ON _____
Date, time, etc.

USED OIL RECYCLING PROGRAM

BEGINS IN (COMMUNITY, CITY, STATE)

(Date) marks the kickoff of (community) used oil reclamation and recycling program.

"We only wish that every community in the Nation could be kicking off it's own oil recycling program today also," said (Name, Title) of (Organization).

The Program, initiated in (date), by (identify and give desired specifics) will be the first effort of its kind staged in (community). "The objectives are many. However, of utmost importance will be our desire to impress upon the do-it-yourself oil changers of (community) the significance of keeping their drainings away from such places as storm drains, garbage and trash recepticles, empty lots and on the ground," said (name). (Name) also cited the need to attract others interest in becoming their own oil changers and how they could be introduced to the proper ways in which it should be done.

(Community) desire to aid in doing its share to combat the harm done to the environment by improper disposal, was yet another reason and last but by far, not least, (name) said "we want to take a giant step for energy conservation by recovery and re-use of this valuable energy resource."

A recent study, conducted by the Department of Energy on "do-it-yourselfers," revealed that in excess of 250 millions gallons of used oil are inadvertently wasted annually by this group alone.

The Department of Energy and the Environmental Protection Agency estimate that in excess of 100 million gallons of used oil are wasted annually.

The (community) program has established a network of collection centers for used oil. Service stations (and whichever other establishments agreeing to do so) have agreed to serve as used oil collectors. One of the incentives is that the collector will be able to sell the used oil to recycling conglomerates and use the proceeds as they wish (use statement only if applicable). The collection points will be identified by posters and their locations publicized area wide. (Name) said, "For our residents, the rest is easy. All they need is a suitable container and a cooperative frame of mind." (Organization) will have brochures, pamphlets and other informational materials to place in circulation. The (organization) has received endorsements from a number of (civic groups, organizations, etc.) and officials in the area, including: (list).

(Name of person) anticipates excellent cooperation and participation on the part of collectors and community residents. Anyone interested in obtaining more information or helping with this campaign should contact (name) at (address) or call (phone number).

DRAFT (Letter to Civic Leader)

(Name)
(Title of Civic Leader)
(Address)

Dear _____:

Can we count on you to help our community recover a potential source of energy while at the same time, eliminate an environmental hazard?

We are in the process of establishing a public service "Recycle Used Oil" program which, we feel, would benefit both our community and the Nation and would appreciate your advice and assistance in its development.

Used oil is a neglected but valuable energy resource. It can be recycled and put back to work as a lubricant or fuel. Not recycled and improperly discarded, it could present a serious hazard to our environment. Throughout our community, used oil is being wasted in surprisingly large amounts. (The Department of Energy and Environmental Protection Agency estimates that the amount of oil wasted annually by "do-it-yourselfers" exceeds 250 million gallons.)

The reason for this occurrence stems basically from the fact that automobile owners who change their own oil do not have proper disposal facilities for the drainings. As a result, it ends up in garbage or trash cans, down storm sewers or in vacant lots and eventually reaches (and pollutes) our streams and rivers. A combined effort to end the pollution, save and re-use the oil, thus conserving energy, will benefit all.

The foundation of our program will be the availability and establishment of a network of convenient used oil collection points in our community and our ability to encourage citizens to discard their used automobile oil at those sites. Thus, we hope to enlist the voluntary participation of civic-minded service station managers and businesspersons who are equipped and would be willing to handle used oil.

Collection facilities might also be set up on public properties such as municipal garages, fire stations or the area dump sites. Each collection point can be identified by a sign or poster.

Publicity of the program and the collection points will be attained through the literature distributed and the media.

The oil discarded can then be sold to a recycler who will ultimately reprocess and prepare it for future marketing.

Your interest and active support of our endeavor will be of tremendous value and will help make this much needed public service a success.

Specifically, we would welcome your endorsement of our effort. Would you, or someone you designate, meet with us to share additional ideas and discuss approaches aimed at creating a sound program?

We welcome a response at your earliest convenience. You may call us at (Phone) or write us at the following address: (List). Thank you for your consideration.

Sincerely,

DRAFT (Letter to Service Station Manager)

We would appreciate your help in a community used oil recycling project designed to conserve energy and preserve our environment.

We are planning a broad-scale program aimed at capturing used oil in which the residents of our town will be encouraged to participate. They will be informed of its energy potential and of the value recycled oil can yield--that it need not be wasted but can be reprocessed and used again.

As you know, many of our citizens change their own oil and would be willing to cooperate with us in this endeavor. However, they need to have a convenient location to deposit their drainings. We choose to call the site a "collection point." Not only will used oil be received there, it will be picked up by a reprocessor to be rerefined and prepared for use once again.

As a station manager, you provide many essential services to car owners in your surrounding area. Would you consider extending your service by establishing collection points for our project? You would be assisting many individuals who, today, dispose of their drained oil in ways that harm our environment and waste a valuable energy resource. The used oil brought to the station would be yours to sell and while rendering a significant service you're also playing an important role in a community project that benefits you, the car owner and the Nation.

It is our belief that such a program can and will be successful if we work at it TOGETHER. Sponsors of the program include:

(NAMES)

We hope that you will join with us, place a sign at your station "Used Oil Welcomed Here," and let us commend your cooperation by including your station in our publicity and printed materials.

Please let us know at your earliest convenience if we can count on you. Write us at the following address: _____ or call (Phone).

Thank you for giving the program your consideration.

Sincerely,

DRAFT (Thank You Letter)

(Name of Participant)
(Company Name, if any)
(Address)

Dear (Name):

We would like to take this opportunity to express our deep appreciation for your interest in (or contribution to) our Used Oil Recycling Program.

Thanks, in part, to your cooperation, more and more used lubricating oil in our community is being collected for recycling. This means we are not only conserving a valuable energy resource, but also reducing the environmental damage caused by indiscriminate dumping of used oil.

Again, our thanks for your help in getting this important program underway.

Sincerely,

(Name)
(Title)
(Organization)

USED OIL REPORT

USED OIL REPORT

INTRODUCTION

Used Oil is generated at a rate of 1.2 billion gallons each year from automotive and industrial sources. Despite being a small part of the total amount of annual petroleum consumed by the nation, it does equate, nevertheless, to more than 780,000 barrels of oil per day.

Although dirty and contaminated, used oil can be re-refined to its original state. Because of its high energy value contents, it can be reprocessed to clean fuel oil, or it can be used as feedstock in manufacturing other petroleum-based products. In industrial application, it can easily be reclaimed to its original quality by sample process of filtration and most of the time with off-the-shelf equipment.

Despite the above stated possiblities, 40 percent or more of all used oil generated in this country is lost from a resource recovery point of view through dumping, land spreading, road oiling, incineration and direct discharge to waterways and municipal sewers. Although this loss is primarily related to the adverse economics of various collection and recovery systems, especially in rural areas, the Department of Energy (DOE) believes that better used oil recovery is possible without Federal subsidization, and regards this objective as an important opportunity for energy conservation.

For sometime now, DOE has had in progress a used oil recycling program. This program is directed towards the development of economically viable re-refining process technology compatible with present-day environmental regulations, and to the encouragement of better used oil collection practices by providing public information.

Furthermore, in the findings of Pubic Law 96-463, Congress declares that

> "(1) used oil is a valuable source of increasingly scarce energy and materials;
> (2) technology exists to re-refine, reprocess, reclaim, and otherwise recycle used oil;
> (3) used oil constitutes a threat to public health and the environment when reused or disposed of improperly; and that, therefore, it is in the national interest to recycle used oil in a manner which does not constitute a threat to public health and the environment and which conserves energy and materials."

Finally, the purpose of this report is to summarize the problem and related issues, and to consolidate and present the results of research and development activities.

USED OIL SOURCES

In 1978, approximately 2.5 billion gallons of lubricating oil were sold in the United States. Approximately 51 percent of this was consumed in use, discarded with filter cartridges, or lost through leakages, and other ways; the

remaining 49 percent accounted for 1.2 billion gallons of collectable used oil. The major sources of used oil are automotive operations, industrial and aviation operations, and others such as government uses and industrial process oils. Table 1 exhibits an estimated amount of oil sold for each category consumed.

The generation of used oil is widely dispersed throughout the country. Table 2 displays estimates of both automotive and industrial used oil quantities for each State, demonstrating the magnitude of both the problem and the opportunity.

Lubricating oils collect contaminants in many ways, depending upon the original use of the oil. In general, used oils contain oxidation products, sediment, water and metallic particles resulting from machinery wear. In addition to these, used automotive oils also contain gasoline, diesel fuel, organic and inorganic chemicals used in oil additives and metals which were present in gasoline and transferred to the crankcase during combustion (blowby). Lead is the principal metallic contaminant found in used automotive oils, being present in amounts which sometimes exceed 1 percent by weight. It is expected that this lead concentration will decline as the use of non-leaded gasoline is increased.

USED OIL DESTINATION

The best estimate of the ultimate fate of the 1.2 billion gallons of used oil generated in 1980 is: 640 million gallons (53 percent) burned as fuel (treated or untreated) or used in miscellaneous activities, e.g., asphalt; 480 million gallons (41 percent) dumped; and the remaining 80 million gallons (6 percent) accounted for total rerefining.

It is not possible to make better estimates regarding the ultimate fate of used oil because the means for accounting for it in the splintered collection, re-refining and disposal systems do not exist at present.

ENVIRONMENTAL IMPACTS OF DUMPING

Altogether, perhaps as many as 575 million gallons of used oil are discharged directly to the environment each year. Disposal methods include road oiling, dust control, weed control, and indiscriminate dumping into waterways, municipal sewers or onto land surfaces. These methods are potentially detrimental to the environment. A concentration of one part oil to a million parts (ppm) water in surface or ground water causes taste and odor problems in drinking water. Concentrations of 50 to 100 ppm can foul waste treatment processes. Results of biological studies indicate different toxicity levels among species, among methods of introducing oil to water, and between marine and freshwater organisms, but significant chronic effects have been found at concentrations of 310 ppm on several species of freshwater fish and at as low as 1 ppm on simpler marine forms.

TABLE 1

	Sales of New Oil 1978 (1,000 gallons)
Automotive Lubricants (retail sales)	642,280
Truck and Fleet (commercial sales)	448,440
Transmission Fluid	217,000
Gear Lubricants (automotive)	45,224
Gear Lubricants (industrial)	50,500
Railway Diesel	51,300
Marine Engine Oils	35,500
Gas Engine Oils	41,500
Hydraulic Oils	234,000
Turbine Oils	84,000
Metalworking Oils	
Cutting and Grinding Oils	64,000
Rolling and Stamping Oils	17,600
Quenching and Tempering Oils	7,500
Rust Preventatives	8,500
Process Oils	353,000
Transformer Oils	98,000
Miscellaneous	97,800
TOTAL	2,496,164

TABLE 2

USED OIL GENERATION BY STATE (ESTIMATED)
GALLONS PER PERSON PER YEAR, 1971

State	Automotive	Industrial	State	Automotive	Industrial
Alabama	5.65	4.88	Montana	9.15	2.45
Alaska	7.05	2.15	Nebraska	9.50	3.91
Arizona	5.44	2.44	Nevada	7.38	1.78
Arkansas	6.31	5.42	New Hampshire	3.45	1.18
California	5.47	3.39	New Jersey	3.82	8.70
Colorado	5.56	2.94	New Mexico	7.10	5.15
Connecticut	3.37	4.07	New York	2.66	2.88
Delaware	5.52	3.30	NorthCarolina	4.60	3.40
District of Columbia	3.25	Unknown	North Dakota	9.70	1.45
Florida	4.42	3.45	Ohio	5.21	9.45
Georgia	5.57	5.52	Oklahoma	7.28	5.61
Hawaii	3.66	Unknown	Oregon	8.71	4.81
Idaho	7.30	1.86	Pennsylvania	4.59	7.97
Illinois	5.08	8.02	Rhode Island	3.06	2.75
Indiana	5.17	8.45	South Carolina	4.09	2.38
Iowa	6.1	2.94	South Dakota	9.79	1.01
Kansas	10.0	4.62	Tennesse	5.38	4.79
Kentucky	7.02	7.10	Texas	6.39	9.89
Louisiana	6.31	11.20	Utah	6.65	3.39
Maine	5.10	2.8	Vermont	4.54	1.45
Maryland	3.56	3.38	Virginia	4.14	2.57
Massachusetts	3.57	3.64	Washington	4.91	2.82
Michigan	6.40	7.45	West Virginia	5.32	13.50
Minnesota	6.45	3.18	Wisconsin	5.92	3.88
Mississippi	6.39	4.20	Wyoming	11.70	4.79
Missouri	6.91	3.35			

ROAD OILING FOR DUST CONTROL

It had been estimated that anywhere between 65 to 70 million gallons of used oil were being used to oil roads for dust control. A limited study has been carried out at the EPA's Water Quality Research Laboratory, Edison, New Jersey, to evaluate the environmental significance of this disposal method. Two rural roads that had been treated with waste crankcase oils were examined. It was estimated that 99 percent of all the oil applied to the road surface over a 12-year period had left the road surface either on dust particles and in water runoff (70 percent) or was volatilized and biodegraded (29 percent). Only 1 percent remained in the top inch of road surface.

Currently, the general pollution control recommended by EPA are being imposed uniformly at the state level, therefore, the amount which were used for road oiling once are now being diverted for other purposes.

"DO-IT-YOURSELF" OIL CHANGERS

Since the early 1960's, the sales distribution of automotive engine oil has shifted dramatically from service stations to retail stores which sell major "high reputation" brands at discount prices. In 1961, service stations accounted for about 70 percent of all sales of lube oil for passenger cars, while mass marketers accounted for only 7 percent. However, a recent survey conducted in 1981, revealed that the share of "do-it-yourselfers" climbed to 64 percent of the total motor oil added and disposed. The survey also concluded that 27 percent or 103 million gallons of their share was for adding (as opposed to oil changes) only.

The survey further revealed that 61 percent of all "do-it-yourselfers" disposed their crankcase oil by outright pouring on the ground or dumping in the trash, while 14 percent was taken to gas stations and the remainder burned or utilized for miscellaneous uses. However, given the perception of recycled oil being better or just as good as virgin oil, a high degree of willingness also exists among this group to return the used oil. The range of their willingness varied anywhere between 66 percent for a convenient collection place to 78 percent for pickup service at home. Table 3 exhibits the annual addition and disposition of motor oil by Census region and division for do-it-yourself households.

COLLECTION OF USED OIL

The largest amount of used oil, however, is not generated by do-ityourselfers, but by commercial and industrial operations: service stations, garages, car dealers, auto fleet maintenance shops, industrial firms, railroads, airports and others.

Quantities generated at commercial and industrial sites are relatively large and stored in old 55-gallon drums or large holding tanks, 550 gallons or more. When these become filled, a used oil collector, or "scavenger," is called to haul the oil away.

TABLE 3

Annual Addition and Disposition of
Motor Oil by Census Region and Division
(in millions of quarts)
for Do-It-Yourself Households

	Oil Added			Oil Used		
	During Change	Between Changes	Total	Drained for Change	Burned or Leaked*	Total
Total	1500	412	1913	1369	543	1913*
Northeast	252	74	328	232	96	328
New England	78	21	99	72	28	99
Middle Atlantic	176	53	229	160	69	229
North Central	414	110	524	378	146	524
East No. Central	291	83	375	266	109	375
West No. Central	122	27	150	112	38	150
South	483	140	623	441	182	623
So. Atlantic	194	63	257	177	80	257
East So. Central	92	18	111	84	26	111
West So. Central	198	58	255	180	75	255
West	349	88	437	318	118	437
Mountain	85	25	110	78	33	110
Pacific	264	63	326	241	86	326
Total (converted to gallons)	375	103	478	342	136	478

* Oil Burned or Leaked = Total Oil Added Less Oil Drained for Changes

In 1974, according to an EPA survey, the industry was comprised of 285 collectors, most of whom were concentrated in urban areas. Of these, some were one-truck operations and few had more than five trucks. Collections are normally carried out by tank wagons or trucks with capacities of between 500 and 2,000 gallons. Until recently, hauls of over 100 miles were usually uneconomical, and this situation accounted for the concentration of collectors in urban areas. More recently, however, some collectors have devised other economical means to travel as far as 500 miles one way for free used oil, and have generally paid for used oil within distances less than that.

In the past, used oil collectors had not, for the most part, been adequately regulated; used oil could, in times of low market demand, be dumped or burned in an environmentally questionable manner and, in times of high market demand, sold for equally questionable purposes, such as "discount home heating oil" to unsuspecting homeowners, apartment managers and schools. However, to combat these problems, the U.S. Environmental Protection Agency (EPA) has recently approved regulations that make the original generator and the waste oil hauler responsible for making sure of a proper disposition of used oil through a certified re-refiner.

Furthermore, EPA is currently drafting a set of regulations pursuant to the Resource Conservation and Recovery Act (P.L. 94-580) which may be proposed in June 1982. These regulations will address various ways in which used oil is being recycled or disposed of including its reuse as fuel, dust suppressant, asphalt extender, etc. The proposed regulations were originally to be issued in the fall of 1981, but an economic analysis required by Executive Order 12291 will not be available until June 1982.

These regulations are mostly welcomed by the collectors who are to abide by a number of vaguely defined regulations that are enforced in different communities today.

THE RE-REFINING INDUSTRY

There are no technical impediments to physically recycling used lube oil. The processes applicable to petroleum refining are generally adequate, with modification, for processing used oil; however, as a matter of practice, virgin crude refineries do not recycle used oil because metallic contaminants present in the used oil can adversely affect some key catalytic refining processes.

Thus, the job of converting used oil into good lube stock becomes the responsibility of the re-refining industry. It is a small industry in the United States, generally using old process technology, and is very susceptible to economic fluctuations. Depending upon local conditions, some re-refiners are currently experiencing difficulties in competing on the open market for used oil feedstocks where, currently, the delivered price of used oil to reprocessing site ranges from 25 to 40 cents per gallon.

There are several different re-refining processes, but the most commonly practiced to date is acid/clay treatment. An EPA study of re-refining technology concludes that acid/clay process does not appear to be an attractive approach for expanding the re-refining industry because of its high operating costs and because of the difficulty in disposing the residual wastes, especially the acid sludge.

Several other re-refining processes are technologically and economically more attractive. Table 4 oulines the characteristics and developmental status of most of the existing processes.

The re-refining industry has declined dramatically both in numbers and in production capacity. Of the 150 re-refiners producing an estimated 300 million gallons of re-refined oil products, in 1960, less than 5 companies are still in business producing less than 25 million gallons. Today most re-refiners are operating at 50 percent of capacity.

The reason for the past decline has been both technical and economic. In recent years, lubricating oils have become more complex with the blending in of between 15 and 20 chemical additives, and re-refined lube oil markets have suffered somewhat from the controversy over whether or not the quality meets current-day specifications. Extended drain periods have concentrated additives and impurities in used oil, making it more difficult to rerefine by the existing technology. Collection costs have increased and disposal of the acid sludge by-product has become more difficult and expensive. Further, the combined result of the Excise Tax Reduction and the IRS Ruling 68-108 had eliminated the tax advantages that the re-refining industry enjoyed. All of the foregoing, together with old and inefficient plants operating at less than design capacity, have generally eroded whatever price advantages re-refined oil products may have had over virgin oil lubricants.

Recent interest by the government in energy conservation and environmental concerns could become the turning point for the industry. The latest technical inventions, combined with an unprecedented number of studies done on every aspect of used oil recycling by the industry and government and the re-evocation of the excise tax, may provide the basis for a viable and growing industry in the future.

USED OIL AS A FUEL

Despite the fact that re-refining used oil results in a net energy savings, when compared to burning, practice of burning used oils as a fuel is a major outlet. Used oil contains approximately the same heating value per pound as virgin oil and about 30 percent more than coal. Burning used oil requires no, or minimal, new technology, has broad applicability in almost all regions of the country and offers an efficient and inexpensive alternative to dumping, land spreading, road oiling and incineration. It can be burned untreated or blended with residual oil or coal.

Unfortunately, because used oil contains high concentrations of metallic contaminants, its unregulated combustion without the removal of these contaminants can cause adverse environmental effects. The quantities of particulates and lead released to the atmosphere during the burning of used automotive oil could be twenty times those emitted by approved facilities having fly ash collection equipment burning similar fuel. From the public health point of view, lead is the most significant contaminant. If all used oil were disposed of by burning, EPA estimates that this could account for as much as five, or even ten percent of all atmospheric lead. Finally, unrestricted burning would result in the continued decline of the re-refining industry through competition for feedstocks.

TABLE 4 - SALIENT FEATURES OF VARIOUS REREFINING PROCESSES

Process	Implementation	Product Quality	Process Yield	Process Energy Requirements	Process Complexity	Other	Hazardous Waste	Additional Advantages	Additional Disadvantages
Acid Clay	EPA restrictions closed or forced changes in most facilities, e.g., S&R oil of Houston.	Can produce a quality lube oil. SF oils may be a problem.	Low 65% when processing used automotive lube oils.	Low 12,000 Btu per gallon of product.	Simple, and readily adaptable to small volumes & batch operations. Can be adapted to semi-continuous operations as well.	Produces acidic sludge & oily clay waste products.	Generates hazardous waste.	Suited to small installations with regional disposition; $2x10^6$ gal/yr disposition is considered large.	Waste disposal; hazardous atmospheric emissions; and economically poor.
Clay	Most widely used, e.g., Warden Oil of Minnesota.	Questionable for highly contaminated oils acceptable for industrial oils.	Low 60% for automotive lubes and high 90% for industrial oils.	Same as acid-clay 12,000 Btu per gal. of product.	Very simple.	Produces oil clay waste product.	Generates hazardous waste.	Mostly used for pre-treatment of used oil to be burned.	Does not produce acceptable engine oil.
Caustic-Clay	Limited use, only one plant known to exist and produces automotive lube oil.	Although thought questionable for highly contaminated oils, production of a quality lube oil is claimed.	Low lube oil yield 62% offset by concurrent production of fuel oil, 16%.	About 40% higher than acid-clay 17,000 Btu per gallon of product if all energy is charged to lube production.	Comparable to acid-clay processes.	Produces caustic sludge and oily clay waste product.	Generates hazardous waste.	Similar to acid-clay.	Similar to acid-clay, sensitive to feedstock variations.
Distillation Clay (RTI)	Most widely used, e.g., LUWA and Pfaudler.	Can produce good quality lube oil.	Higher than acid-clay, 75%.	13,000 Btu per gallon of product.	Moderate, simpler than Distillation Hydrotreating.	Same as distillation, coking & fouling heat exchangers.	Will remove most classes.	Can be retrofitted to existing facilities. Simpler than other new technologies.	

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TABLE 4 - SALIENT FEATURES OF VARIOUS REREFINING PROCESSES (Continued)

Process	Implementation	Product Quality	Process Yield	Process Energy Requirements	Process Complexity	Other	Hazardous Waste	Additional Advantages	Additional Disadvantages
Propane Extraction (IFP Process)	Newly developed process with two European plants in production.	Can produce a quality product.	Despite a high yield of 82% claimed by process developer, a moderate yield of 70% is reported by plant operators to date.	Very high, more than twice as much as clay or up to 32,000 Btu per gallon of product.	Relatively complex & suited to large-scale operations. Propane section operates on a continuous basis.	Requires acid-clay finishing step, which can be either batch or semi-continuous.	Generates hazardous waste.	Produces good quality oil.	Economically unattractive.
Distillation Hydro- (KTI)	Despite the existence of several variations of this process only one plant is currently under construction in West Germany and no U.S. installations is reported to date.	Should be capable of producing a quality lube oil.	Significantly higher than acid-clay, 76%.	Slightly higher than for acid-clay 13,000 Btu per gallon of product.	Somewhat complex & suited to large-scale continuous operations.	Requires solution of distillation column fouling & catalyst poisoning problems.	Will remove most classes of hazardous waste.	Simpler than other newer technologies.	Not proven.
BETC ST/D	Pilot plant operation has produced rerefined oil for engine sequence & field tests.	Producing high quality oil that passed all engine sequence tests for an SE oil rating (the commercial spec).	Higher than acid-clay, 75%.	20,000 Btu per gallon of product.	Relatively complex. Currently engineered for continuous operations.		Will remove most classes of hazardous waste.	Possible to retrofit to a degree into existing acid-clay or virgin petroleum refinery.	Lacks commercialization. Requires 5×10^6 gal. per yr. or larger capacity for economic viability.

TABLE 4 - SALIENT FEATURES OF VARIOUS REREFINING PROCESSES (Continued)

Process	Implementation	Product Quality	Process Yield	Process Energy Requirements	Process Complexity	Other	Hazardous Waste	Additional Advantages	Additional Disadvantages
Phillips Rerefined Oil (PROP)	Pilot test completed. Two commercial size plants are located in NC and Canada.	Met Military (MIL-L-46152A) specification requirements for administrative fleet usage.	75-80%	Not available	Similar in complexity to distillation hydrotreating BETC.		Will remove some classes of hazardous waste.	Turn key plant. Big oil. backing.	Must buy complete plant, feedstock sensitive, cannot be retrofitted. Requires $5x10^6$ gal. per yr. or larger capacity for economic viability.
MZF Solvent	Lab test tube stage. Process evaluation based on this data. Has least development work of all the processes reported.	Lab date reports good removal of metallic contaminants which should produce quality lube oil after undergoing subsequent fractionation and clay contacting.	Significantly higher than acid-clay process, 76%.	greater than twice as much as acid-clay up to 25,000 Btu per gallon of product.	Should be comparable solvent extraction processes and suited for semi-continuous or batch operations.	Emulsion separation by centrifugation replaced by use of an undisclosed de-emulsication agent claimed to be low in cost.	Unknown	Insufficient information.	Insufficient information.

BEST DOCUMENT AVAILABLE

The restricted burning of used oil can be successfully carried out by treatment to remove those compounds that are detrimental to the combustion operation and blending the treated product with a virgin fuel. The treatment process involves removing the contaminants prior to burning and can be combined with highly efficient particulate control systems to reduce preventable lead discharge after burning. The former is commonly practiced through water/solids mechanical separation systems known as "reprocessors." The latter can be accomplished by fabric filtration (bag houses), electrostatic precipitation and high-energy venturi scrubbers. Recent studies indicate that these systems can remove between 95 and 99 percent by weight of submicron-sized particles, which constitute the last 80 percent of lead emissions. These systems have been installed not only at electric utilities, but also at numerous industrial sites throughout the country: paper mills, steel mills, cement and rock product plants and others.

SPECTROMETRIC OIL ANALYSIS (SOA)

Owners and managers of large automotive and truck fleets, as well as the railroads and airlines, have been saving thousands of gallons of oil annually be employing a technique known as spectrometric oil analysis, or oil analysis for short. The principal purpose of oil analysis is to predict equipment failure and schedule preventive maintenance. This can be done by testing a small sample of the crankcase oil in commercially available equipment, which will then yield readings on wear metal content. High readings of wear metal content reveal failures of bearings, gears and other internal engine parts, and indicate the need for repairs, thus allowing a fleet manager to avoid costly breakdowns, as well as unnecessary maintenance. A side benefit is that one can determine exactly when oil needs changing, rather than changing it as a matter of course every so many thousands of miles or hours of operation. This is often the case, and perfectly good oil is drained, thrown away, and replaced at needless cost. Thus, oil analysis can save a fleet manager money in his maintenance operations as well as in his lubricating oil budget.

USED OIL (FROM DIESEL ENGINES ONLY) AS DIESEL FUEL SUPPLEMENT

Mixing used oil with diesel fuel as a fuel supplement has been recognized by at least one major diesel engine manufacturer as an acceptable method of disposing of used oil while at the same time reducing fuel costs. The process generally calls for draining the used oil, diluting it somewhat with diesel fuel, filtering it with commercially available equipment to remove water and sludge, and finally mixing it with five percent or less new fuel. Published test results of a process similar to this one have shown, after 100,000 miles of operation, no adverse effects upon the engine, engine performance or the fuel system, and did indicate some favorable reductions in smoke emissions. Such results have been achieved under specific test conditions and procedures, and before attempting to duplicate such a process, one should contact the manufacturer of the diesel engine in question and, perhaps, the research staffs of some trucking and fleet owner magazines.

OIL REFINERS FOR INSTALLATION IN YOUR VEHICLE

Lately, a number of firms now manufacture devices which can be installed in automobiles, trucks, busses, boats and on stationary engines, which are known variously as "oil refiners, electric oil refiners and oil purifiers." These manufacturers claim that once they have been installed, one never needs to change oil again, and needs only to add oil as the dipstick may indicate and to occasionally change filters. These devices are installed in the engine compartment and hooked into the oil pressure system of the engine by means of hose connections. Oil flows through the device under pressure, is filtered either through cotton and felt pads or through fuller's earth, is heated electrically so as to volatilize water and fuel contaminants, which escape as vapor, and is then returned to the oil pan by gravity flow.

Manufacturers of more sophisticated industrial oil reclamation equipment point out that while this process may remove water, fuel and suspended solids, it does not return the oil to the same quality as that of new oil. They note that after prolonged use, it is not the oil, but the special oil additives designed to enhance oil quality which break down. These devices do not replace the spent oil additives nor do they remove dissolved metal oxides which accumulate during fuel combustion. Proponents rebut by pointing out that when one adds new oil as needed, these additives are more than replaced and that spectrometric oil analysis tests do not indicate the need for oil changes.

It is generally agreed that these devices do extend the life of engine oil and can save oil. Whether or not they will allow one to never change oil again is an issue which triggers heated debates but has not been resolved. Before installing such a device, it would be wise to check with your vehicle manufacturer.

DEPARTMENT OF ENERGY USED OIL RECYCLING PROGRAM

The Waste Products Utilization Branch, within the DOE's Office of Industrial Programs, is responsible for the support of needed research and development projects that industry cannot or will not support because of their high risk, or, in some cases, the improbability that a sponsoring firm could capture the benefits of being first to develop a particular process innovation. Recognizing that used oil was a sizeable resource which was being less and less utilized, since 1976 this office has supported the re-refining process technology development group at DOE's Bartlesville Energy Technology Center (BETC). The BETC R&D program was supported to accelerate the development of modern re-refining technology more compatible with present day environmental controls. Subsequently, this support has been broadened to include studies of the potential for increased re-refining, providing information to groups at the local and state levels who are interested in oil collection programs, participation in intragrovernmental efforts to recover and recycle the government's used oil, commercial-scale process monitoring and evalution, and a comprehensive study of re-refining process hazardous wastes. The need for this support arises from the fact that oil recycling companies are, with few exceptions, very small businesses in a long-declining industry.

The thrust of the Used Oil Recycling Program to date has been directed to developing an environmentally acceptable, more efficient process to replace the outmoded acid-clay process, together with related technical studies. These projects, many of which have been performed or administered by the Bartlesville Energy Technology Center (BETC), located in Bartlesville, Oklahoma, have ranged from laboratory testing of re-refininery feedstock consistency, to performing the first documented engine sequence tests and full-scale fleet tests ever run on re-refined lube oils. Two publications: 1) Fact Sheet describing this program and identifying over thirty related technical publications; 2) an Activities Summary illustrating the historical background, major current issues, potential for resource conservation and possible future events are presently available at the Waste Products Utilization Branch, Office of Industrial Programs, Conervation and Solar Energy, U.S. Department of Energy, 1000 Independence Avenue, N.W., Washington, D.C. 20585.

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TABLE 4 - SALIENT FEATURES OF VARIOUS REREFINING PROCESSES (Continued)

Process	Implementation	Product Quality	Process Yield	Process Energy Requirements	Process Complexity	Other	Hazardous Waste	Additional Advantages	Additional Disadvantages
Acid Clay	EPA restrictions closed or forced changes in most facilities, e.g., S&R oil of Houston.	Can produce a quality lube oil. SF oils may be a problem.	Low 65% when processing used automotive lube oils.	Low 12,000 Btu per gallon of product.	Simple, and readily adaptable to small volumes & batch operations. Can be adapted to semi-continuous operations as well.	Produces acidic sludge & oily clay waste products.	Generates hazardous waste.	Suited to small installations with regional disposition; $2x10^6$ gal/yr disposition is considered large.	Waste disposal; hazardous atmospheric emissions; and economically poor.
Clay	Most widely used, e.g., Warden Oil of Minnesota.	Questionable for highly contaminated oils acceptable for industrial oils.	Low 60% for automotive lubes and high 90% for industrial oils.	Same as acid-clay 12,000 Btu per gal. of product.	Very simple.	Produces oil clay waste product.	Generates hazardous waste.	Mostly used for pretreatment of used oil to be burned.	Does not produce acceptable engine oil.
Caustic-Clay	Limited use, only one plant known to exist and produces automotive lube oil.	Although thought questionable for highly contaminated oils, production of a quality lube oil is claimed.	Low lube oil yield 62% offset by concurrent production of fuel oil, 16%.	About 40% higher than acid-clay 17,000 Btu per gallon of product if all energy is charged to lube production.	Comparable to acid-clay processes.	Produces caustic sludge and oily clay waste product.	Generates hazardous waste.	Similar to acid-clay.	Similar to acid-clay, sensitive to feedstock variations.
Distillation Clay (RTI)	Most widely used, e.g., LUWA and Pfaudler.	Can produce good quality lube oil.	Higher than acid-clay, 75%.	13,000 Btu per gallon of product.	Moderate, simpler than Distillation Hydrotreating.	Same as distillation, coking & fouling heat exchangers.	Will remove most classes.	Can be retrofitted to existing facilities. Simpler than other new technologies.	

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(TABLE 4 Continued)

Propane Extraction (IFP Process)	Newly developed process with two European plants in production.	Can produce a quality product.	Despite a high yield of 82% claimed by process developer, a moderate yield of 70% is reported by plant operators to date.	Very high, more than twice as much as clay or up to 32,000 Btu per gallon of product.	Relatively complex & suited to large-scale operations. Propane section operates on a continuous basis.	Requires acid-clay finishing step, which can be either batch or semi-continuous.	Generates hazardous waste.	Produces good quality oil.	Economically unattractive.
Distillation Hydro- (KTI)	Despite the existence of several variations of this process only one plant is currently under construction in West Germany and no U.S. installations is reported to date.	Should be capable of producing a quality lube oil.	Significantly higher than acid-clay, 76%.	Slightly higher than for acid-clay 13,000 Btu per gallon of product.	Somewhat complex & suited to large-scale continuous operations.	Requires solution of distillation column fouling & catalyst poisoning problems.	Will remove most classes of hazardous waste.	Simpler than other newer technologies.	Not proven.
BETC ST/D	Pilot plant operation has produced rerefined oil for engine sequence & field tests.	Producing high quality oil that passed all engine sequence tests for an SE oil rating (the commercial spec).	Higher than acid-clay, 75%.	20,000 Btu per gallon of product.	Relatively complex. Currently engineered for continuous operations.		Will remove most classes of hazardous waste.	Possible to retrofit to a degree into existing acid-clay or virgin petroleum refinery.	Lacks commercialization. Requires $5x10^6$ gal. per yr. or larger capacity for economic viability.

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(TABLE 4 Continued)

Phillips Rerefined Oil (PROP)	Pilot test completed. Two commercial size plants are located in NC and Canada.	Met Military (MIL-L-46152A) specification requirements for administrative fleet usage.	75-80%	Not available	Similar in complexity to distillation hydrotreating BETC.		Will remove some classes of hazardous waste.	Turn key plant. Big oil. backing.	Must buy complete plant, feedstock sensitive, cannot be retrofitted. Requires $5x10^6$ gal. per yr. or larger capacity for economic viability.
MZF Solvent	Lab test tube stage. Process evaluation based on this data. Has least development work of all the processes reported.	Lab date reports good removal of metallic contaminants which should produce quality lube oil after undergoing subsequent fractionation and clay contacting.	Significantly higher than acid-clay process, 76%.	greater than twice as much as acid-clay up to 25,000 Btu per gallon of product.	Should be comparable solvent extraction processes and suited for semi-continuous or batch operations.	Emulsion separation by centrifugation replaced by use of an undisclosed de-emulsication agent claimed to be low in cost.	Unknown	Insufficient information.	Insufficient information.

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